PATENT ABSTRACTS OF JAPAN

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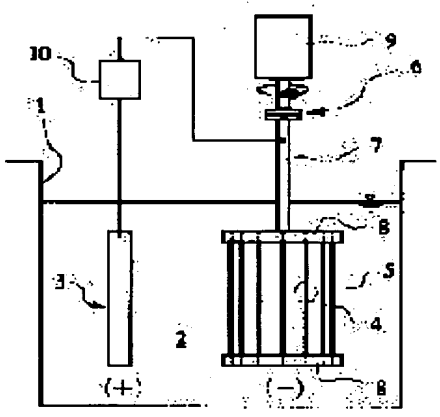
(54) PRODUCTION OF FINE-HOLE TUBE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain the fine-hole tube typified by a feed tube, high in inner face precision, which a nonuniform strain hardly formed in the sectional shape of the inner space even by bending by forming a metallic coating film on the core surface and removing the core while leaving the coating film.
SOLUTION: A rod-shaped core material 4 of specified length is attached to the rotating jigs 8 and then dipped is an electroless Ni plating tank to form a first metallic coating film on the core material 4 surface. A rotating shaft 7 is taken out from the electroless Ni plating tank and fixed to a driving motor 9, the core material 4 is used as the negative electrode 5 of an electric caster and dipped in an Ni electroless plating tank 1, and a current is applied between the positive and negative electrodes, the core material 4 is simultaneously rotated in an electrolyte 2 by operating a rotating mechanism 6 and let stand, and a second metallic coating film is formed on the surface of the core material 4 as the negative electrode. Subsequently, the core material 4 is taken out from the plaing tank 1, detached from the jigs 8 and attached to a core remover, and the core is wound and removed leaving metallic coating film.



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CLAIMS

[Claim(s)]
[Claim 1]A manufacturing method of a fine-pores tube forming a fine-pores tube by forming a metal tunic on the surface of a core material, leaving a formed metal tunic, and removing a core material.
[Claim 2]A manufacturing method of the fine-pores tube according to claim 1 using resin lines in which a tunic of a conductor was formed on the surface for said core material, and drawing out and removing these resin lines.
[Claim 3]A manufacturing method of the fine-pores tube according to claim 1 using an aluminum wire for said core material, and dissolving and removing this aluminum wire.
[Claim 4]Hold said core material with a negative pole terminal, and this negative pole terminal and a positive pole terminal are immersed in an electrolytic plating tub filled with an electrolysis solution, respectively, A manufacturing method of the fine-pores tube according to claim 1, 2, or 3 electrocasting rotating a negative pole terminal in an electrolysis solution while making between two poles into an energization condition, and forming a metal tunic in the surface of said core material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the manufacturing method of a fine-pores tube.
[0002]
[Description of the Prior Art]In propulsive engines, such as a rocket and an artificial satellite, it excels in heat resistance, and sectional shape is the same to the feed tube which circulates propellants, such as hydrazine, also in which part, and, moreover, what has high inner surface accuracy is requested from it.
[0003]The feed tube was conventionally manufactured by the following drawing processings. First, padding of the metal used as the raw material of a feed tube is fabricated tubular, and it draws out through the end of a pipe to the stoma equal to the outer diameter of a desired feed tube. It can narrow metaled padding leaving a hole inside by this, and is fabricated to a feed tube.
[0004]
[Problem(s) to be Solved by the Invention]There were the following problems about the feed tube manufactured by the conventional drawing processing.
(1) It is deficient in inner surface accuracy as the characteristic of drawing processing, and in order to select the portion with which it is satisfied of the state of the inner surface which can be equal to actual use, an inspection and separating operation of inner surface accuracy are needed about the processed feed tube. And there are few portions sorted out noting that it is actually usable out of the processed feed tube, and the yield is dramatically bad.

(2). In order to actually attach to a propulsive engine the cylindrical feed tube by which drawing processing was carried out, perform bending to a feed tube and make it change into the target shape. By performing bending etc., an uneven distortion is generated by the sectional shape of inner space carrying out flat, and there is a possibility that the flow characteristics of the propellant which flows through the inside of a feed tube may get worse and destabilize.
[0005]This invention is made in light of the above-mentioned circumstances, and about a fine-pores tube which is represented by the above-mentioned feed tube, inner surface accuracy is high and it aims at providing the manufacturing method which does not generate an uneven distortion easily in the sectional shape of inner space due to bending.
[0006]
[Means for Solving the Problem]As above-mentioned The means for solving a technical problem, a metal tunic is formed on the surface of a core material, and a manufacturing method of forming a fine-pores tube is adopted by leaving this metal tunic and removing a core material.
[0007]It is desirable to use resin lines in which a tunic of a conductor was formed on the surface, and an aluminum wire for a core material. It is desirable to adopt a method of drawing out and removing a core material in the case of resin lines, and to adopt a method of dissolving and removing a core material in the case of an aluminum wire.
[0008]In order to form a metal tunic on the surface of a core material irrespective of resin lines and an aluminum wire, A core material is held with a negative pole terminal, this negative pole terminal and a positive pole terminal are immersed in an electrolytic plating tub filled with an electrolysis solution, respectively, and there is a method of electrocasting, while making between two poles into an energization condition and rotating a negative pole terminal in an electrolysis solution.
[0009]
[Embodiment of the Invention]A 1st embodiment of the manufacturing method of the fine-pores tube concerning this invention is shown in drawing 1 thru/or drawing 4, and is described. Especially this invention is a method for manufacturing the feed tube for thruster engines of an artificial satellite (fine-pores tube). This manufacturing method is provided with the following.
The process of electrocasting to a core material and forming a metal tunic on the surface of a core material (it is hereafter considered as an electroforming process).
The process of leaving a metal tunic and removing this core material about the core material by which electroforming was made (it is hereafter considered as a core material removal process).
The process made to transform into predetermined shape the feed tube obtained by a core material being removed, or the core material which should form a metal tunic (it is hereafter considered as a deformation-processing process).

[0010]The electroforming device shown in drawing 1 is used for an electroforming process. To this electroforming device, the electrolysis nickel plate tub 1, the anode 3 immersed in the electrolysis solution 2 with which it was filled in this electrolysis nickel plate tub 1, and the negative electrode 5 supported in the state where the electrolysis solution 2 was made to immerse this core material 4 while holding as a state which can energize the core material 4 possess. The disc-like rotating jigs 8 and 8 of the couple with which the end estranged in the length direction and was provided in the end of the axis of rotation 7 supported pivotable and this axis of rotation 7 in the state where it was immersed in the electrolysis solution 2, as the rolling mechanism 6 which makes the negative electrode 5 rotate the core material 4 in the electrolysis solution 2 furthermore are formed. Among both the rotating jigs 8 and 8, the core material supporter 8a which lays [firmly] and supports the core material 4 vacates regular intervals, and are formed at the periphery of the rotating jig 8. [two or more] The drive motor 9 made to rotate this is connected to the other end of the axis of rotation 7, and it is removable to the drive motor 9 in the axis of rotation 7. The voltage loading means 10 is established among positive/negative two poles.
[0011]Then, each process for manufacturing a feed tube is explained. Here, resin lines are used for the core material 4.
[-- 1. -- conductor coating formation process], after attaching to the rotating jigs 8 and 8 the cylindrical core material cut by predetermined length, As shown in drawing 2, it is immersed in the tub (it is hereafter considered as an electroless nickel plating tank) 11 filled with the electrolysis solution containing electroless nickel, and predetermined carries out time neglect, and as shown in drawing 3 (a), the 1st metal tunic (conductor tunic) 12 of electroless nickel plating is formed in the surface of the core material 4.
[0012][-- 2. -- electroforming process] -- if it checks that the 1st metal tunic 12 has been formed in the surface of the core material 4, the axis of rotation 7 will be picked out from the electroless nickel plating tank 11. Subsequently, the drive motor 9 is equipped with this axis of rotation 7, and after making the core material 4 immersed in the electrolysis nickel plate tub 1 as shown in drawing 1 as the negative electrode 5 of an electroforming device, between positive/negative two poles is made into an energization condition. Predetermined carries out time neglect, operating the rolling mechanism 6 simultaneously with an energization start, and rotating the core material 4 in the electrolysis solution 2, and as shown in drawing 3 (b), the 2nd metal tunic 13 of an electrolysis nickel plate is formed in the surface of the core material 4 which is the negative electrode 5 from on the 1st metal tunic 12.
[0013][-- 3. -- core material removal process] -- if it checks that the metal tunic 14 which doubled the 1st metal tunic 12 and the 2nd metal tunic 13 has become predetermined thickness, energization will be stopped, the core material 4 is taken out from the electrolysis nickel plate tub 1, and it removes from the rotating jig 8. And the core material 4 by which the metal tunic 14 was formed in the surface is attached to the core material removal jig shown in drawing 4. The holding part 15 which this core material removal jig grasps the end of the metal tunic 14 formed in the surface of the core material 4, and is fixed, The core material 4 is removed from the metal tunic 14 by the rolling-up roller 16 arranged so that the core material 4 may be contacted in the side of the core material 4 which projects from the end of the fixed metal tunic 14 possessing, rolling round the end of the core material 4, and making the roller 16 roll round.
[0014][-- 4. -- deformation-processing process] -- the portion which remained while the formed state of the tunic cut and removed the uneven both-ends portion about the tubular metal tunic 14 which remained after the core material 14 was removed is cut to predetermined length, and a cylindrical feed tube is obtained. And the feed tube which has predetermined shape as parts for thruster engines eventually is obtained by performing bending to this feed tube.
[0015]If the above-mentioned manufacturing method is adopted, the thickness of the 2nd metal tunic 13 can be uniformly finished by electrocasting rotating the negative electrode 5 holding the core material 4 in the electrolysis solution 2. Since the surface disposition of a core material is transferred by the inner surface of a feed tube with the transfer property of electroforming, a feed tube with high inner surface accuracy can be obtained because a surface disposition uses a smooth raw material as the core material 4. Thereby, the yield of a product can be raised.

[0016]Although it has a mechanism in which the axis of rotation 7 which attached the core material 4 is rotated, in the electroforming device in this embodiment, it may constitute rotating the mechanism in which change to this and only the core material 4 is rotated, or the core material 4 so that it may have a mechanism in which the axis of rotation 7 is also rotated further.
[0017]Next, a 2nd embodiment of the manufacturing method of the feed tube concerning this invention is described. Resin lines are used for a core material.
[-- 1. -- conductor coating formation process] -- after attaching to the rotating jigs 8 and 8 the cylindrical core material 4 cut by predetermined length like a 1st embodiment, it is immersed in the electroless nickel plating tank 11, predetermined carries out time neglect, and the 1st metal tunic 12 of electroless nickel plating is formed in the surface of the core material 4.
[0018][-- 2. -- electroforming process] -- if it checks that the 1st metal tunic 12 has been formed in the surface of the core material 4, the axis of rotation 7 will be picked out from the electroless nickel plating tank 11. Subsequently, the drive motor 9 is equipped with this axis of rotation 7, and after making the core material 4 immersed in the electrolysis nickel plate tub 1 as the negative electrode 5 of an electroforming device, between positive/negative two poles is made into an energization condition. Predetermined carries out time neglect,

operating the rolling mechanism 6 simultaneously with an energization start, and rotating the core material 4 in the electrolysis solution 2, and the 2nd metal tunic 13 of an electrolysis nickel plate is formed in the surface of the core material 4 which is the negative electrode 5 from on the 1st metal tunic 12.

[0019][-- 3. -- deformation-processing process] -- if it checks that the metal tunic 14 which doubled the 1st metal tunic 12 and the 2nd metal tunic 13 has become predetermined thickness, energization will be stopped, the core material 4 is taken out from the electrolysis nickel plate tub 1, and it removes from the rotating jig 8. And bending is performed to the core material 4 so that it may become the shape of the feed tube which the metal tunic 14 needs.

[0020][-- 4. -- core material removal process] -- the feed tube which has predetermined shape as parts for thruster engines eventually is obtained by putting into the thermal treatment equipment which does not illustrate the core material 4 to which bending was performed, heating, leaving the metal tunic 14, and drawing out and removing the core material 4 which is resin lines.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is an explanatory view showing the electroforming device used for the manufacturing method of the fine-pores tube concerning this invention.
[Drawing 2]It is an explanatory view showing the state where the core material was immersed in the electroless nickel plating tank.
[Drawing 3]It is an explanatory view showing the state of the metal tunic formed on the surface of a core material.
[Drawing 4]It is an outline lineblock diagram showing the core material removal jig used for the manufacturing method of the fine-pores tube concerning this invention.
[Description of Notations]
1 Electrolysis nickel plate tub
2 Electrolysis solution
3 Anode
4 Core material
5 Negative electrode
6 Rolling mechanism
7 Axis of rotation
8 Rotating jig
9 Drive motor
10 Voltage loading means
11 Electroless-nickel-plating layer
12 The 1st metal tunic (conductor tunic)
13 The 2nd metal tunic
14 Metal tunic
15 Holding part
16 Rolling-up roller

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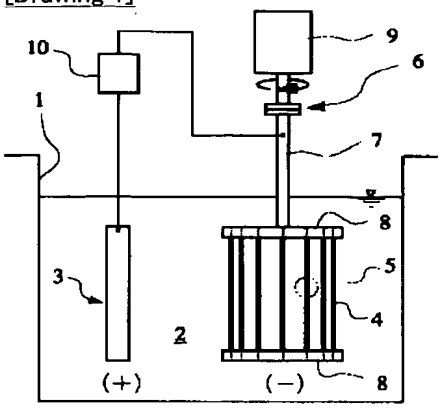
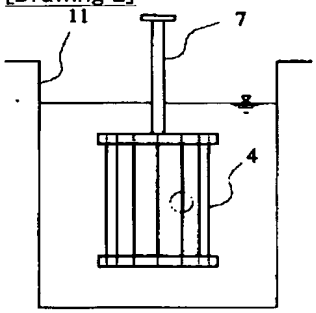
DRAWINGS

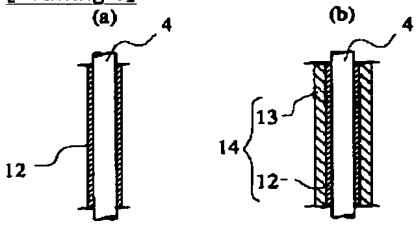
[Drawing 1]



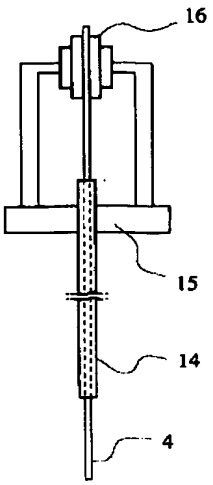
[Drawing 2]



[Drawing 3]



[Drawing 4]



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最終頁に続く

(54)【発明の名称】　細孔チューブの製造方法

(57)【要約】

【課題】　従来の引き抜き加工により製造されたフィードチューブは、内面精度に乏しく、加工されたフィードチューブ全体に対して実際に使用可能な部分が少なく、歩留まりが悪い。

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